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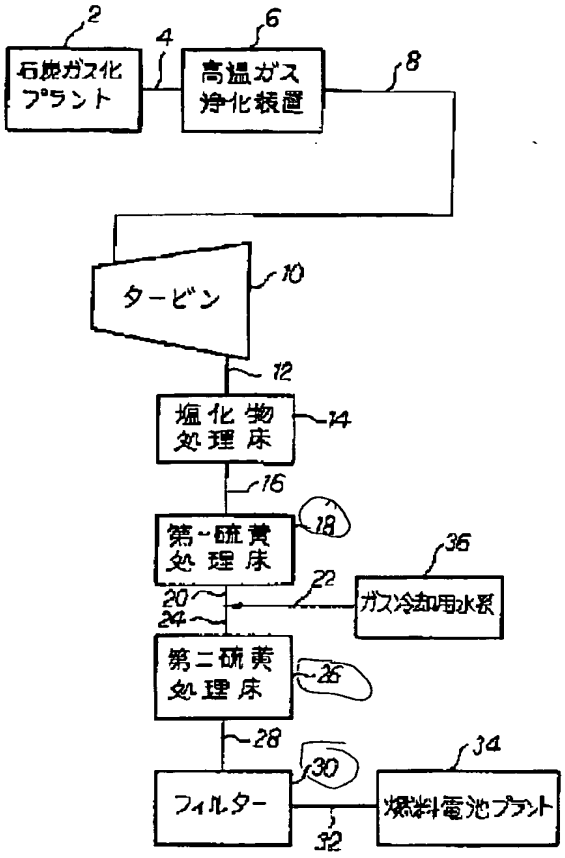
TITLE : SEPARATOR FOR IMPURITY OF HIGH-TEMPERATURE COAL GAS



ABSTRACT : PURPOSE: To obtain a fuel gas useful as a fuel, etc., for a fuel cell by expanding a high-temperature coal gas, producing a low-temperature coal gas at a lowered temperature, generating a power, efficiently separating impurities of the high- temperature coal gas and reducing the concentrations of sulfur, chlorides and volatile metallic components.

CONSTITUTION: This separator for impurities of a high-temperature gas is obtained by expanding a high-temperature coal gas at a higher temperature than 593°C under a higher pressure than 17.5 ata, producing a low-temperature coal gas at a lower temperature than, e.g. 427°C under a lower pressure than 7 ata, generating power, simultaneously separating impurities from the low- temperature coal gas and separating the impurities of the high-temperature coal gas. Furthermore, the separator is preferably equipped with a turbine device 10 for lowering the temperature and pressure of the high-temperature coal, a chloride treating bed 14 for separating the impurities at the lowered temperature under the lower pressure, the first sulfur treating bed 18, the second sulfur treating bed 26 and a filter 30.

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(54) SEPARATOR FOR IMPURITY OF HIGH-TEMPERATURE COAL GAS

(57)Abstract:

PURPOSE: To obtain a fuel gas useful as a fuel, etc., for a fuel cell by expanding a high-temperature coal gas, producing a low-temperature coal gas at a lowered temperature, generating a power, efficiently separating impurities of the high- temperature coal gas and reducing the concentrations of sulfur, chlorides and volatile metallic components.

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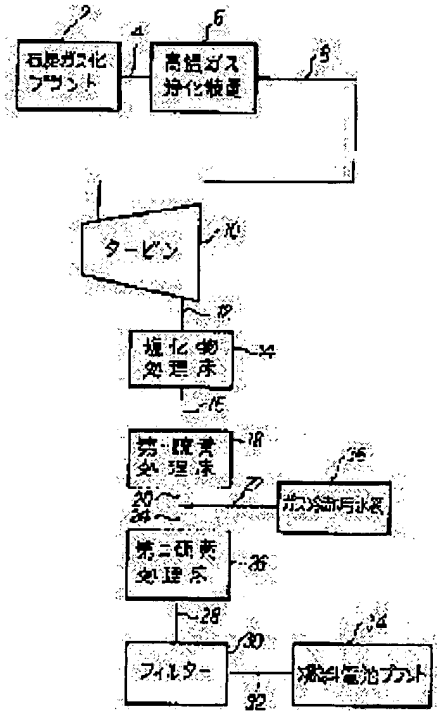

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bed 18, the second sulfur treating bed 26 and a filter 30.

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* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] Turbine equipment which generates the descent temperature coal gas which elevated-temperature coal gas was expanded and carried out the temperature reduction, and is made to generate power; the impurity decollator of th elevated-temperature coal gas characterized by having descent temperature separation means; which separates an impurity from the aforementioned descent temperature coal gas.
[Claim 2] The impurity decollator of the elevated-temperature coal gas according to claim 1 characterized by equipp the upstream of the aforementioned turbine equipment with an elevated-temperature separation means further in orde to separate an impurity from the aforementioned elevated-temperature coal gas.
[Claim 3] The aforementioned elevated-temperature separation means is a reproduction means for carrying out adsorption separation of the sulfur content from the aforementioned elevated-temperature coal gas, and the impurity decollator of the elevated-temperature coal gas according to claim 2 characterized by having ceramic filter equipmen which carries out filtration removal of the particle-like impurity from the aforementioned elevated-temperature coal gas.
[Claim 4] The aforementioned descent temperature separation means is the impurity decollator of the elevated-temperature coal gas according to claim 1 characterized by having chloride adsorption-treatment equipment which carries out the adsorption treatment of the chloride from the aforementioned descent temperature coal gas.
[Claim 5] The aforementioned chloride adsorption-treatment equipment is an impurity decollator of the elevated-temperature coal gas according to claim 4 characterized by having the chloride processing floor which consists of a particle-like sodium bicarbonate.
[Claim 6] The aforementioned descent temperature separation means is the impurity decollator of the elevated-temperature coal gas according to claim 1 characterized by having the means which carries out adsorption separation a sulfur content or the sulfur compound from the quenching means for carrying out the temperature reduction of the temperature of the means which carries out the adsorption treatment of a sulfur content or the sulfur compound from the aforementioned descent temperature coal gas, and the aforementioned descent temperature coal gas, and generati a low temperature gas, and the aforementioned low temperature gas.
[Claim 7] Each of each meanses which carries out adsorption separation of a sulfur content or the sulfur compound from the aforementioned descent temperature coal gas or the aforementioned low temperature gas is the impurity decollators of the elevated-temperature coal gas according to claim 6 characterized by having processing floor equipment which used the particle floor of a zinc oxide.
[Claim 8] The aforementioned descent temperature separation means is the impurity decollator of the elevated-temperature coal gas according to claim 6 characterized by having the sintered metallic filter which carries out filtrat removal of the impurity which the shape of a particle carries out from the aforementioned low temperature gas.
[Claim 9] A means adsorb a sulfur content from the quenching means; aforementioned low temperature gas for the aforementioned descent temperature separation means carrying out the temperature reduction of the temperature of t means; aforementioned descent temperature coal gas which adsorbs a sulfur content from the means; aforementioned descent temperature petroleum gas which adsorbs a chloride from the aforementioned descent temperature petroleum gas, and generating a low temperature gas; it is the impurity decollator of the elevated-temperature coal gas accordin to claim 1 characterized by to have filter equipment; which carries out the filtration removal of the impurity which th shape of a particle carries out from the aforementioned low temperature gas.
[Claim 10] The process which the descent temperature coal gas with which elevated-temperature coal gas was expanded and temperature descended is generated [process], and generates power; the impurity separation method o the elevated-temperature coal gas characterized by having process; which separates an impurity from the

aforementioned descent temperature coal gas.
[Claim 11] It is the impurity separation method of the elevated-temperature coal gas according to claim 10 characterized by for the aforementioned elevated-temperature petroleum gas being in a pressure higher than about 17 ata(s) (250psia) while being in temperature higher than about 593 degrees C (1100F), and the aforementioned descen temperature petroleum gas being in a low pressure from about 7 ata(s) (100psia) while being in low temperature from about 427 degrees C (800F).
[Claim 12] The impurity separation method of the elevated-temperature coal gas according to claim 10 characterized having further the process which separates an impurity from the aforementioned descent temperature petroleum gas.
[Claim 13] The process which separates the aforementioned impurity is the impurity separation method of the elevat temperature coal gas according to claim 10 characterized by having the process which separates a chloride from the aforementioned descent temperature petroleum gas.
[Claim 14] The process quenched for the process which separates the aforementioned impurity carrying out the temperature reduction of the temperature of the process; aforementioned descent temperature coal gas which separat a sulfur content or a sulfur compound from the aforementioned descent temperature coal gas, and generating a low temperature gas; it is the impurity separation method of the elevated-temperature coal gas according to claim 10 characterized by having process; which separates a sulfur content or a sulfur compound from the aforementioned low temperature gas.
[Claim 15] The aforementioned elevated-temperature petroleum gas is in a pressure higher than about 17.5 ata(s) (250psia) while being in temperature higher than about 593 degrees C (1100F). It is the impurity separation method elevated-temperature coal gas according to claim 14 that it is in a low pressure from about 7 ata(s) (100psia), and the aforementioned low temperature gas is characterized by being in low temperature from about 260 degrees C (500F) while the aforementioned descent temperature petroleum gas is in low temperature from about 427 degrees C (800F)
[Claim 16] The process which separates the aforementioned impurity is the impurity separation method of the elevat temperature coal gas according to claim 14 characterized by having the process which separates a particle-like impur from the aforementioned low temperature gas.
[Claim 17] The process which separates the aforementioned impurity The process which separates the process; sulfu content which separates a chloride from the aforementioned descent temperature petroleum gas, or a sulfur compoun from the aforementioned descent temperature petroleum gas; The temperature reduction of the temperature of the aforementioned descent temperature coal gas is carried out. The process which separates a sulfur content or a sulfur compound from the process; aforementioned low temperature gas which generates a low temperature gas; A particle like impurity is separated from the aforementioned low temperature gas. The impurity separation method of the elevated-temperature coal gas according to claim 10 characterized by having process; which generates the coal gas whose impurity decreased very much.
[Claim 18] The aforementioned coal gas whose impurity decreased very much is the impurity separation method of t elevated-temperature coal gas according to claim 17 characterized by being suitable as fuel gas for fuel cell plants.
[Claim 19] The aforementioned coal gas whose impurity decreased very much is about 0.01 ppm. Chlorine content a few about 0.01 ppm The impurity separation method of the elevated-temperature coal gas according to claim 17 characterized by having few sulfur content and hardly including a particle-like impurity and a suspension metal component.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] this invention relates to the equipment which removes an impurity from coal gas, in order to supply the fuel gas of a fuel cell fuel especially, gasifies coal and relates to the impurity decollator of the elevated-temperature coal gas which makes elevated-temperature gas and is washed.
[0002]
[Description of the Prior Art] The fuel cell which joins together electrochemically and generates fuel gas and oxygen gas is known. Here, fuel gas is supplied from a coal gasification plant.
[0003] The impurity in coal gas, for example, sulfur, a chloride, and various particulate matter to accompany must be enough removed by the fuel slack of a fuel cell to the low.
[0004]
[Problem(s) to be Solved by the Invention] Some two methods are conventionally unsuitable to a fuel cell. Namely, sufficient removal cannot be performed and, as for the "elevated-temperature" gas cleanup system known from the former, cost requires the efficiency of removal too much on a low in a "low-temperature" gas cleanup system.
[0005] Although it is in system efficiency falling by the latent-heat loss by the steam in fuel gas condensing the fault this "low-temperature" gas cleanup system, a thing called this condensation removes the waste water which contains impurity out of gas, brings it upwards within environmental standards, and is required operation. Another is that the cost (both the cost of equipment and operation cost) heated to the temperature which can supply the coal gas which cooled coal gas to the above-mentioned range, and was purified further to a fuel cell is high.
[0006]
[Means for Solving the Problem] The coal gas purification system of this invention avoids the above problems, and i can purify coal gas until it becomes impurity content low-concentration enough.
[0007] First, the equipment from which the impurity in elevated-temperature coal gas is removed is considered. This equipment lowers the temperature of gas, and a pressure while collecting ******** power for elevated-temperature coal gas to a turbine, and it applies the impurity separation method in low temperature comparatively there.
[0008] This system shall be installed in the lower stream of a river of conventional elevated-temperature gas cleanup equipment. And similarly the low-temperature removal method of this invention consists of the adsorption means of low temperature gas to a chloride, the adsorption means of a low temperature gas to sulfur and the cooling means which lowers the temperature of a low temperature gas further, a means to adsorb the sulfur in the gas which became low temperature further, and the filter that separates the company particle in this low temperature gas.
[0009] The process which separates an impurity from elevated-temperature coal gas is also examined. This process expands elevated-temperature gas, it takes out power, and lowers gas temperature with it, and separates an impurity from the gas which was able to lower this temperature.
[0010] They are 427 degrees C and 7ata about about 593 degrees C and the gas of 17.5 or more atas which came out the elevated-temperature purification system in this system. It is made to expand.
[0011] The process which separates an impurity from the gas which was able to lower temperature has the partition stage of a chloride, a sulfur content, and a company particle.
[0012]
[Example] The example of the purification system of this invention is shown in drawing 1 .
[0013] The coal gas 4 generated in the coal gasification plant 2 is purified by usual elevated-temperature gas cleanup equipment 6, and turns into the hot coal gas 8 with which the impurity was separated. Coal gas 8 is 593 degrees C an 17.5ata in the place which came out of elevated-temperature gas cleanup equipment 6. It is above and they are 649

degrees C and 22.4ata in fact. It has become.
[0014] The impurity of coal gas 8 is the thing of the level separated by the elevated-temperature gas cleanup system which is the conventional technology. That is, as a means, it is based on the method by the centrifuge method, the elevated-temperature ceramic filter, and the reproduced type sulfur adsorption bed. That is, coal gas 8 is the halogenated compound (mainly Hcl) of the 2 volume ppm, and about 15 ppm. A steam or a condensed thing of an arsenic, lead, hydrogen, a selenium, and zinc etc. is included in the particle and it which escaped from sulfur (H2 S), the elevated-temperature ceramic filter, or the centrifugal separator.
[0015] Elevated-temperature coal gas 8 generates power at the same time it expands in a turbine 10 and lowers temperature itself. As for it, it is ideal 7ata(s) and to fall at about 427 degrees C or less. In the case of the system of t invention, it will be in the state of about 4.2 ata(s) and 382-degree C gas 12.
[0016] By lowering the temperature of coal gas, the advantage that an impurity is very removable even on low level with the existing technology can be efficiently employed as compared with the conventional elevated-temperature ga cleanup process.
[0017] Expanding coal gas in a turbine, as thought by this process defined system can avoid generating of the waste water which comes out suitable cost and suitable efficiency in the so-called conventional low-temperature-gas cathar while the temperature of ****** gas can be dropped, and it is convenient.
[0018] The coal gas 12 which carried out the temperature reduction receives processing to the chloride processing flo 14, and a chloride is removed. The chloride processing floor 14 consists of bicarbonate od soda and the activated alumina. These are matter usually used to remove a chloride from gas. Or in this processing floor 14, particle-like bicarbonate od soda is also sometimes often used.
[0019] This chloride processing floor 14 is designed so that level of the chloride in gas 12 can be performed at the cheapest cost to carry out to below a certain desired value. The chloride concentration of the gas 16 of the outlet is th 0.01 volume ppm in this way. It can be made below.
[0020] A temperature reduction is carried out, next, the coal gas flow 16 used as low-salt ghost concentration receive processing to the 1st sulfur processing floor 18, and a sulfur compound is removed.
[0021] The material used to remove sulfur ordinarily is used for this 1st sulfur processing floor. For example, the zincic-acid ghost held at a particle-like zincic-acid ghost or particle-like support is used.
[0022] This 1st sulfur processing floor 18 is designed so that the sulfur compound in gas may be made below into a certain level at cheap cost. It is about 1.0 volume ppm about the sulfur content of coal gas [in / the outlet of the sulfu processing floor 18 / in this way] 20. It can lower even to level.
[0023] It quenches further the coal gas 20 with which the temperature reduction was received, the chloride was removed, and the sulfur content was removed with water 22, and it turns into the gas 24 for a low-salt ghost and low sulfur which received the temperature reduction further. Probably the gas of 24 points can be made into 260 degrees 204 degrees C or less according to the quenching effect by water.
[0024] A temperature reduction is received, the gas 24 by which the chloride and the sulfur content were removed receives processing to the 2nd sulfur processing floor 26 further, and a sulfur content is removed further. The quality the material with which the material used for this 2nd sulfur processing floor is also used to remove sulfur from a ga stream ordinarily is used. It is the zincic-acid ghost held at the particle or support of the same zincic-acid ghost, for example using the 1st processing floor. The design of this 2nd processing floor can also be designed by the same usu method as the 1st processing floor, and can lower the sulfur content in gas to below a certain planned level. At this example, it is the 0.01 volume ppm about the sulfur content of outlet gas 28. It can be made below.
[0025] A temperature reduction is received, next, the gas by which chloride concentration and sulfur-content concentration descended is filtered with a filter 30, and the trap of various particulate matter, the metal condensed in gas is carried out here. A filter 30 should just use the stable matter under these conditions of the filter material used very ordinarily, for example, a sintered metal and polymeric materials. For example, probably, therefore, 204 degree of sintered metals of the state of gas 28 will be good here. Probably, a fibrous macromolecule filter will be good in a place which was cooled by 177 degrees C or less.
[0026] The design method of the filter for lowering the particle in gas or the concentration of a condensation metal to below a predetermined value is good at the conventional conventional method. The filter 30 considered now sets substantially the above-mentioned particle in a gas stream 32 etc. to 0. That is, these matter can be moved back even undetectable level by the usual method.
[0027] The gas stream 32 is clean even on the level by which supplying as fuel to a fuel cell plant is not hindered. Th is, high impurity concentration here has become below a value predetermined enough.

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[0028] A thing called the level of a certain kind of impurity is decided based on the value over the allowed value of whether it can supply a fuel cell plant. The level which is called clean gas in now is the chloride 0.01 volume ppm. Following and sulfur-content 0.01 volume ppm The fused carbonate fuel cell of 40,000 hours or more can be hereaft supplied with a suspended particle 0 and the condensation metal 0 substantially. If required, the level of an impurity can decrease further. That is, what is necessary is to lower the temperature of 28 points further and just to install furt 1 or between two or more chloride processing floors, the sulfur-content processing floor 26, and a filter 30.
[0029]
[Effect of the Invention] The coal gas purification system concerning this invention sets up suitable temperature and suitable conditions, and the following things become possible by this. That is, the concentration of 1 sulfur or a chloride can fully be lowered to low level.
2) It can be made to condense until concentration falls to level to the extent that an volatile metal component is undetectable enough.
3) Sintered-alloy filter and fibrous filter effective enough can be worked, without being accompanied by degradation material and corrosion.
[0030] The width of face of big selection can be given in the design of a final purge, and selection of the material, without [without it makes moisture condense by lowering coal gas to low temperature, and] reducing system efficiency.
[0031] Although the suitable example was explained above, various modifications and the example of substitution ar possible, without shifting from the fundamental view in this invention.

[Translation done.]